Why don't electrons moving around the nucleus radiate energy?

Bezverkhniy Volodymyr Dmytrovych.

Ukraine, e-mail: bezvold@ukr.net

This question is more than 100 years old, and it was the search for an answer to it that gave the strongest impetus to the development of quantum mechanics. Let's try to answer it again.

If we consider an electron in orbit as a standing wave, then everything is OK - a standing wave should not radiate energy. When an electron moves to another orbit, the characteristics of the standing wave change and, as a result, energy is absorbed or emitted.

But, if we consider an electron in orbit as a corpuscle, using Bohr's principle of complementarity, then we have problems... And only the postulates of Niels Bohr, which simply prohibit radiation, will help.

Although... if an electron in orbit does not have a trajectory, then why should it radiate energy.

I think that when an electron moves in orbit, Cooper pairs and superconductivity (the theory of Bardeen - Cooper - Schrieffer) can be used as an analogy [1, 2].

If we consider the motion of an electron in orbit as in superconductivity, then no energy should be emitted. In addition, electrons in orbit also combine into pairs.

"...Electrons near the Fermi surface can experience effective attraction, interacting with each other through phonons... only those electrons are attracted whose energy differs from the energy of electrons on the Fermi surface by no more than h * ν(D), where ν(D) is the Debye frequency, the other electrons do not interact.

These electrons combine into pairs, often called Cooper's. Cooper pairs, unlike individual electrons, have a number of properties characteristic of bosons, which, when cooled, can go into one quantum state. We can say that this feature allows the pairs to move without colliding with the lattice and the remaining electrons, that is, without losing energy...

Leon Cooper considered the formation of a bound state of two electrons having opposite spins and velocities and suggested that these pairs could be responsible for the superconducting state. He pointed out the possibility of the formation of a bound state of two electrons at the Fermi level during the exchange of phonons, which can be qualitatively considered in the form of a dynamic interaction of conduction electrons with vibrations of the ionic crystal lattice.

When an electron flies with/next to ions, it attracts ions and creates a positive charge density behind it, which attracts another electron opposite in spin and speed (in this case, the interaction is maximum)..." [3].

The analogy is very good. Moreover, the distance between electrons in Cooper pairs is approximately a micron, and the "distance" between electrons in orbit is fractions of an angstrom, so in the second case, the

interaction will be much stronger and more energetic. The last few years I like this analogy. I think she has a great future.

For example, we identify the Cooper pair of electrons with the Lewis pair of electrons [4] and we can try to explain the chemical bond in a new way. After all, a common pair of electrons is the basis of our knowledge of covalent bonds over the past 100 years. And there is no strict calculation of the chemical bond even now, just as it did not exist 100 years ago.

Therefore, as always, you need to think, work... and maybe someday you will be lucky.

1. Bardeen, J.; Cooper, L. N.; Schrieffer, J. R. (April 1957). Microscopic Theory of Superconductivity. Physical Review. 106 (1): 162–164. Doi: 10.1103/PhysRev.106.162.

2. Bardeen, J.; Cooper, L. N.; Schrieffer, J. R. (December 1957). Theory of Superconductivity. Physical Review. 108 (5): 1175–1204. Doi: 10.1103/PhysRev.108.1175.

3. BCS theory. Wikipedia (ru). https://en.wikipedia.org/wiki/BCS_theory

4. Lewis, Gilbert N. (April 1916). The atom and the molecule. Journal of the American Chemical Society. 38 (4): 762–785. https://doi.org/10.1021/ja02261a002